Space Power: A Theory for Sustaining US Security Through the Information Age

A Monograph

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Abstract

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The United States requires a logical and practical space power theory that relates to national interests. This monograph explains how activities in the space domain influence US national interests. The relationship between space power and national interests is the basis to present a new space power theory. Further, the proposed space power theory establishes relationships between the activities in the space domain. The space activities identified as critical to the United States' national security are space exploration, commercial space endeavors, and space enablers. A space protection framework is presented to allow freedom of action within the critical space activities. Previous space power theories are analyzed for both shortfalls and useful ideas. The proposed space power theory applies the Mahan's sea power theory as the framework based on generating national economic prosperity through freedom of action in the space domain.

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Chapter One: Introduction

> Our investment in space is rapidly growing and soon will be of such magnitude that it will be considered a vital interest – on par with how we value oil today. . . it is not the future of military space that is critical to the United States – it is the continued commercial development of space that will provide continued strength for our great country in the decades ahead. Military space, while important, will follow.[1]
>
> --General Howell M. Estes, III, 1998
> Commander, US Space Command

The United States requires a logical and practical space power theory that relates to national interests. The space domain is of growing importance globally, and logically competition between both nations and commercial enterprises are increasing. However, as noted by Colin Gray, space power theory is severely underdeveloped.[2] Colin Gray is not alone in his call for new ideas. The Department of Defense, other US national agencies, and leading members of the space community are searching for not only ideas, but narratives on space power theory.[3] This is not to suggest that nothing has been written on space power theory; several space power theories do exist. However, many of these theories focus on the military aspects of space. A more holistic notion of space power theory is needed for healthy discussion.

This monograph fills the gap in current space power theory. This monograph presents a space power theory that is novel in two aspects. First, this space power theory directly relates the space domain to national interests of the United States. Second, this

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[1]Everett Dolman, Peter Hays and Karl Mueller, "Toward a U.S. Grand Strategy in Space," *Space Security - Policy and Arms Control,* http://www.marshall.org/pdf/materials/408.pdf (accessed December 7, 2010).

[2] Colin S. Gray, *Modern Strategy* (Oxford: Oxford University Press, USA, 1999), 293.

[3] Howell Estes, foreword to *Space Power Theory,* by James Oberg, (US Air Force Academy, 1999), x.

space power theory establishes relationships between the major activities in the space domain. Current space power theory neither addresses the linkage between the space domain and national interest nor does it relate activities such as commercialization and space protection. Additionally, prevailing space power theory lacks the strategic framework to accomplish these linkages. However, this monograph presents a holistic, systems-based approach to space power theory and provides a practical framework for understanding and application. Again, the research must show the relationship between space power and national interests.

This monograph proposes a space power theory in the following manner. First, the great power and major power concepts are presented as tools to analyze the impact of activities in the space domain with respect to US national security. Second, this monograph presents three fundamental space power theories developed over the last thirty years. The three fundamental space power theories provide a point of departure for new ideas and offer approaches to activities in the space domain. Next, this monograph describes the relationship of activities in the space domain to national security, prosperity, and growth. International political theory provides the analytical tools to test the influence of the space domain on the relative strength of the United States. The test results reinforce certain aspects of previous space theory. A framework is presented based on the relationship of commercial space endeavors, space exploration, space enablers, and the space protection concept to fill the gap of current space power theory.

Understanding historical power theory development is important to the integration of national power through emerging domains such as space and cyber. Land power, sea power, and air power theories are the foundation for the United States' military strategy.

Notable power theorists include Carl von Clausewitz, Alfred Mahan, Julian Corbett, Guilio Douhet, and Billy Mitchell. These theorists presented their ideas through several different methods based on unique approaches to extending national power over the land and through the sea and air. Selecting a medium and theorist as a point of departure provides for modeling and testing of the proposed theory based on historical and environmental medium similarities. This monograph identifies sea power as a point of departure from which to build a model specific for space. However, space differs from the sea. Adapting developed theories to emerging power domains drive discussion and concept development.

Several influential space theorists have provided creative ideas, thoughtful narrative, and generated useful discussion. The space power theorists discussed in this paper are Lt Col (Retired) David Lupton, James Oberg, and Dr. Everett Dolman. The order indicates the relative timing of their publications. Lupton, Oberg, and Dolman were selected to demonstrate three different perspectives over three decades. Several additional ideas by space power theorists contributed to this monograph and are noted. David Lupton first identified the four schools of thought on space power in the 1980's and detailed the five pillars of the control space power doctrine. The Secretary of Defense commissioned James Oberg, through US Space Command, to develop and publish space power theory. Oberg developed thirteen "truths", beginning the discussion on space power theory in earnest. Dr. Everett Dolman applied his understanding of Lupton's schools of thought and Oberg's "truths" to a space power theory within the context of modern geopolitics. Dolman has generated considerable discussion with his ideas on space dominance. Again, there is a lively discussion on space power theory. This paper is

intended to build on these ideas and present a practical and comprehensive space power theory.

The aim of this monograph is to clearly answer why space is important and show how space sectors are related. The major space sectors discussed are space exploration, commercial space endeavors, national space enablers, and military space protection. The theoretical framework places exploration, commercial endeavors, and national enablers at the core, while military space protection allows for the unfettered freedom of action within the core space sectors. The entire system functions to project power from the United States into the global economic market, the contemporary security environment, and into geopolitics through freedom of action within the space domain.

Chapter Two: The Relationship of Status as a Great Power and US National Security

This monograph uses the great power concept to demonstrate the relationship of space power to US national interests. Great power status is not a finite position. Great power status is conceptual. The following chapter outlines a great power framework. This great power framework is then applied to understand the impact of space activities to US national power. The United States garners a great deal of national security from the relative position of great power status. Further, this chapter identifies why great power status is required to sustain US national security.

International relations theorists describe the concept of great power status several different ways. Most express the characteristics of a great power in terms of economic, military, diplomatic, and cultural strengths. Although Paul Kennedy does not provide a concise definition of a great power in *The Rise and Fall of the Great Powers*, he does argue the importance of effectively combating external threats as an essential characteristic of great powers. Kennedy states that most great powers exist because of the influence created through revenue-raising potential. [4] Amy Chua in *Day of Empire* postulates that great powers, and specifically hegemonies, rely heavily on pluralism and tolerance during rise to preeminence.[5] The most holistic view of contemporary great powers is that of Kenneth N. Waltz, a leading international relations theorist, in his book *Theory of International Politics*.[6] Waltz presents five criteria in evaluating a great power:

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[4] Paul Kennedy, *The Rise and Fall of the Great Powers* (New York: Vintage, 1989), XVI.

[5] Amy Chua, *Day of Empire: How Hyperpowers Rise to Global Dominance--and Why They Fall*, Reprint ed. (Anchor, 2009), XXI.

[6] Kenneth N. Waltz, *Theory of International Politics* (Waveland Pr Inc, 2010), 131.

population and territory, resource endowment, economic capability, political stability and competence, and military strength. Vesna Danilovic generalizes these five criteria in her book *When Stakes are High* and states that major powers are generally specified using one or more of the following elements: power dimension, spatial dimension, and the status dimension.[7]

According to Danilovic,

> 1. The power dimension reflects the sheer size of a nation's capabilities. Despite a number of methodological disagreements, such as those over the amount of capabilities necessary for a nation to qualify as a major power, power potential is nevertheless routinely acknowledged as a necessary defining requirement for major powers.
>
> 2. The spatial dimension refers to geographic scope of interests, actions, or projected power. Although often neglected in the literature, the spatial criterion is especially significant for distinguishing major powers from regional powers.
>
> 3. The status dimension indicates a formal or informal acknowledgement of the major power status. Since the official or unofficial status of a major power also requires the nation's willingness to act as a major power, it is the most subjective and thus more difficult criterion to establish empirically.

Danilovic synthesizes the fundamental elements for status as a major power. Danilovic does not use the term great power; however, the concept is essentially the same. Further, her dimensions serve as effective evaluation criteria for determining the significance of space power. Specifically, this monograph uses the power, spatial, and status dimensions to examine aspects of space power that contribute to United States' national security.

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[7] Vesna Danilovic, *When the Stakes Are High: Deterrence and Conflict among Major Powers* (Ann Arbor: University of Michigan Press, 2002), 27.

The terms great power and major power refer to a concept. The concept is the relative ability of a nation to provide for security of the nation and to sustain required economic growth. This monograph shows that space power directly influences international relations power concepts for the United States. However, all states do not require space power for this end. Additionally, all states do not require hegemonic power to sustain security and economic growth. Each nation operates within a unique context. This unique context provides the conditions that establish the most appropriate approach to security and economic development. A historical example that illustrates this difference between power typology and national security is the examination of France before, during, and following World War II. Most international relations theorists contend that France was a great power during the 1930s and 1940s; however, status alone did not assure its national security. The concept of great power status complements national security for particular nations, facing particular challenges, at a particular time. This point is significant because many nations may not require space power to meet national objectives. However, this monograph shows that the United States does require space power to retain great power status as a national security objective. Great power status is linked to national security in the current *US National Security Strategy*:

The 2010 National Security Strategy for the United States requires great power status in order to effectively achieve its objectives. Specifically, the potential for action, power projection, and self-recognition as a global leader are three salient themes within the 2010 US National Security Strategy. A key paragraph within the introduction highlights the connection between status as a great power and the National Security Strategy.

> Our national security strategy is, therefore, focused on renewing American leadership so that we can more effectively advance our interests in the 21st century. We will do so by building upon the sources of our strength at home, while shaping an international order that can meet the challenges of our time. This strategy recognizes the fundamental connection between our national security, our national competitiveness, resilience, and moral example. And it reaffirms America's commitment to pursue our interests through an international system in which all nations have certain rights and responsibilities.[8]

Therefore, in the case of the United States in today's context, national security is directly linked to maintaining requirements which satisfy the three dimensions of a major power as defined by Vesna Danilovic.

American scientific innovation is critical to advancing US national interests. America has garnered its strength from a national character of perseverance and innovation forged on the American frontier. This national character revealed itself on center stage as the major power conflicts of the industrial age developed. David Potter in his book *People of Plenty* writes that America has risen to the status of a great power due to an abundance of resources and a character of perseverance and innovation.[9] The United States built on the foundation of resources and perseverance in the early 20th century to develop national strength.

Captain Alfred Mahan developed a sea power theory in the 1880's to capitalize on the United States' potential strength. Mahan presented a similar argument in the 1880's with regard to innovation, commercial endeavors, and military capabilities. Mahan recognized America's potential to attain great power status. Mahan identified the common characteristics that America could use to become a great power and the

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[8] The White House, "National Security Strategy, 2010," 4.

[9] David Potter, *People of Plenty: Economic Abundance and the American Character*, (University of Chicago Press, 1954), XXVI.

characteristics required to develop and maintain effective maritime operations. Mahan cited several historical examples to support his theory. His examination centered on England's rise as a great power due to its Navy and commercial shipping dominance. Mahan also cited examples such as Spain, which did not capitalize on its characteristics, and failed to maintain its status as a great power despite enormous capital resources. In the first chapter of *Influence of Sea Power Upon History, 1660-1783*, Captain Mahan describes the following characteristics as essential considerations in maintaining a Navy and the commercial shipping requisite for national prosperity.[10]

- Geographical Position.
- Physical Conformation, including natural productions and climate.
- Extent of Territory.
- Number of Population.
- Character of the People.
- Character of the Government.

Captain Alfred Mahan and David Potter's theories have similarly applied to America's rise to great power status into the 21st century. However, history indicates that past performance does not guarantee future success. Therefore, this monograph identifies the role of space power in the information age as Mahan identifies the role of sea power in the industrial age. Specifically, the United States sustains prosperity through maintaining the attributes of a great power. The 2010 US National Security Strategy reinforces this assertion.

[10] Alfred Mahan, *The Influence of Sea Power Upon History: 1660-1783*, (Little, Brown, 1890), 28-29.

Paul Kennedy and Amy Chua examine the impacts of economics and cultural relativism respectively on the rise and fall of great powers. Their research provides guiding principles which allow nations operating within Vesna Danilovic's major power model to adapt based on national resources, vulnerabilities, potentials, and threats. Paul Kennedy states that historically great powers fail because national requirements in the power and spatial dimension overcome the national capital raising potential. Kennedy writes that military actions are normally the activities which over-extend the capital raising capabilities of the state. However, military capability is normally the foundation of capital growth, expansion, and sustainment. Kennedy argues that great powers reach a point of rapidly diminishing returns when expensive state expenditures, such as war, do not result in sustainable returns in capital.

Kennedy's economic theory is closely related to Amy Chua's sociologic theory of great powers. Chua contends that states must remain pluralistic and create a franchised society based on a common sense of nationalism. This nationalism allows for a collaboration of ideas and national intellectual synergy. The United States' rise to great power status in the power, status, and spatial dimensions are clearly centered on the theories posited by Paul Kennedy and Amy Chua. Therefore, activities sought by the United States must support the major power test provided by Vesna Danilovic while balancing the guiding principles provided through the historical case studies of Amy Chua and Paul Kennedy. The following chapter reviews space power theory over the past thirty years. The fundamental problem with past space power theory is that it fails to relate space power to the concepts of attaining and sustaining national power as outlined by international relations theories. The major power test within the Danilovic framework,

guided by Kennedy, Chua, and Waltz, is necessary to link space power to US national interests.

Chapter Three: Review of Space Power Theory

> Despite these previous efforts to develop a comprehensive theory and strategy of space warfare, it has been observed that such a strategic framework – one encompassing the essence of space operations and associated national interests – has yet to be formulated.[11]
>
> -- John Klein, *Space Warfare*, 2006

The following chapter considers several explanations of space power by leading space power theorists. Further, this chapter offers a critic of space power theory in order to capture the imperatives of space power which relate to supporting the United States' security requirements in today's environment. The imperatives identified by previous space power theorists serve as the framework to refine space power theory. The application of space power theory aligns the elements of space power to achieve strategic objectives. As identified in the introduction, current space power theory neither addresses the linkage between the space domain and national interest nor does it relate activities such as commercialization and space protection. However, United States space policy is the mechanism to properly align the elements of space power. The ultimate goal of space power theory is to inform space policy development.

Power Paradigms

Land, sea, and air power theories significantly influence national and military strategy. The terms land power, sea power, and air power originate with the Western military theorists of the last two hundred and fifty years. Carl von Clausewitz, Alfred Mahan, Julian Corbett, Guilio Douhet, and Billy Mitchell each combined the application of national resources with policy as the basis for their theory. These power theories

[11] John J. Klein, *Space Warfare: Strategy, Principles and Policy* (Space Power and Politics) (LONDON: Routledge, 2006), 3.

sought to maximize control of each respective medium as a base for national power. This does not suggest that naval strategy did not exist prior to Mahan or Corbett. The concept of sea power was developed to explain the rise to power of nation-states as they leveraged military, commercial, and political mechanisms operating on and through the sea. Alfred Mahan and Julian Corbett both captured the theory of sea power; however, each framed the concept differently. Understanding the differences between Mahan and Corbett with respect to control of the sea allow for the critical examination of space power theory. Everett Dolman succinctly compares the approaches to the concept of sea power by Mahan and Corbett in his book, *Pure Strategy*.[12] Dolman addresses the debate of the feasibility of commanding the sea by Mahan's standard as challenged by Corbett. The following provides an overview of space power theory formulation from the 1980's and includes the Mahanian examination of space power by Dolman.

Space Power Theory Overview

Lt. Col. David E. Lupton wrote *On Space Warfare: A Space Power Doctrine* while serving as a research fellow at the Airpower Research Institute from 1980 to 1983. Lupton discovered early in his research that space power doctrine was absent. However, he uncovered several unofficial schools of thought on the role of space and national power. Lupton analyzed the unofficial doctrine and provided a theory for consideration. Further, Lupton presented five pillars necessary to support his space power doctrine. The following is an overview of Lupton's space power theory.

[12] Everett Dolman, *Pure Strategy: Power and Principle in the Space and Information Age* (Strategy and History) (London: Routledge, 2005), 39-40.

Lupton categorized space doctrine into four schools of thought as discussed at symposia during the course of his research: sanctuary doctrine, high-ground doctrine, survivability doctrine, and doctrine termed as the control school. The basic tenet of the sanctuary doctrine is the application of unfettered observation from space to support the U.S. nuclear deterrence policy of the Cold War. Therefore, under the sanctuary doctrine, space should remain uncontested for all nations in order to allow treaty verification. Lupton argued that the sanctuary doctrine is no longer feasible, or alternatively, that it does not pass the "currency test".[13] The high-ground doctrine is founded on the premise that the deterrent strategy is flawed. Therefore, space based weapons are required to defeat the Inter-Continental Ballistic Missile (ICBM) threat. Additionally, the high-ground doctrine expands the defensive role of ballistic missile defense to weapon systems designed to target terrestrial objectives as well. Lupton argued the high-ground doctrine is not a practical alternative to deterrence strategy both technologically and politically.[14] Survivability doctrine suggests that, in lieu of creating space defensive systems, governments should increase the survivability of space vehicles attacked by anti-satellite weapons (ASAT) and reduce the risk of attack through retaliation in kind strategy. Although survivability of satellites could be increased through shielding and hardening, Lupton argues the cost outweighs the probability of maintaining the payload capabilities.[15]

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[13] David Lupton, *On Space Warfare: A Space Power Doctrine*, (Air University Press, 1988), 57. The original impetus for the sanctuary doctrine was that space seemed to have very little military value past the deterrent value described in the sanctuary tenet.

[14] Ibid., 102.

[15] Ibid., 86.

The control school of doctrine serves as Lupton's recommended space power doctrine. Lupton applies Admiral Alfred T. Mahan's method of doctrinal analysis to examine the control school doctrine through relating military experience to applicability of new military technology. Lupton categorizes the control school in the following points:

- Control as a concept.
- Control limited to specific areas.
- Hierarchy of control.
- Advantages at the environmental boundaries.
- Control force organization.
- Implementation method.
- Tempo of exercising control.

Key points to understand Lupton's analysis include: control of a medium as a capability rather than a condition, restrict the lines of control during hostilities to specific areas of space, understand the line of advantage at the space boundary, apply centralized control to space forces, focus the use of space forces on the destruction of enemy space forces, and understand the operational tempo unique to space operations.[16]

Lupton developed tenets to support a control space power doctrine. The five pillars of space control doctrine includes: 1) logistical structure capable of meeting the objectives associated with all orbital locations; 2) man in space in order to overcome the fog and friction of space operations; 3) space based surveillance system in order to maintain situational awareness of the space environment; 4) space control weapons

[16] Ibid., 107-115.

capable of denying the enemy strategic areas of space and defending US space assets; 5) organizational structure to meet the competing demands of protecting and directing space force assets and apportioning space based assets to support joint and interagency requirements.[17] Lupton's space power theory seeks to control the space medium based on his five space power tenets.

Lupton's space power theory informs the following statements. The sanctuary and high ground schools are neither practical nor feasible. Further, the survivability school is cost prohibitive under the current propulsion technology. However, survivability as a concept is an integral component of space power theory. Lupton's recommended space power theory is the control school of doctrine. The control school contains powerful ideas in terms of the ways and means of controlling space. However, Lupton fails to link his theory to national interests other than to suggest space control is important. Lupton's tenets are clear and practical but lack an explanation of the relationships to each other or to the commercial aspect of space. Linking the commercial aspect of space is critical for a Mahanian approach to the space domain.

James Oberg substantially contributed to the body of knowledge of both orbital mechanics and space power theory. According to his official webpage, James Oberg served as a NASA contractor conducting space shuttle operations in support of orbital rendezvous over a twenty-two year career.[18] During which time, Mr. Oberg became a leading historian of the Soviet (now Russian), Chinese, and European space programs.

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[17] Ibid., 127.

[18] James Oberg, "Profile," JamesOberg.com, http://jamesoberg.com/profile.html (accessed October 28, 2010).

United States Space Command requested Oberg publish a space power theory in 1996 based on his published works on the technical and political aspects of space. James Oberg published *Space Power Theory* in 1999 with the intent to serve as the opening statement of a meaningful debate on space power theory.[19] Oberg developed the following thirteen truths to serve as his space power theory.[20]

- The primary attribute of current space systems lies in their extensive view of the Earth.
- A corollary of this attribute is that a space vehicle is in sight of vast areas of Earth's surface.
- Space exists as a distinct medium.
- Space power, alone, is insufficient to control the outcome of terrestrial conflict or insure the attainment of terrestrial political objectives.
- Space power has developed, for the most part, without human presence in space, making it unique among all forms of national power.
- Situational awareness in space is a key to successful application of space power.
- At some time in the future, the physical presence of humans in space will be necessary to provide greater situational awareness.
- Technological competence is required to become a space power, and conversely, technological benefits are derived from being a space power.
- Control of space is the linchpin upon which a nation's space power depends.
- As with earthbound media, the weaponization of space is inevitable, though the manner and timing are not at all predictable.
- Scientific research and exploration pays off.
- Space operations have been and continue to be extremely capital intensive.
- There will be wild cards.

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[19]Howell M. Estes, et. al., *Space Power Theory*, (Colorado Springs: US Air Force Academy, 1999), Introduction.

[20] James E Oberg, *Space Power Theory* (US Air Force Academy, 1999), 124-31.

In addition to Oberg's thirteen truths, *Space Power Theory* highlights the requirement to protect space assets. Interestingly, Oberg applies Mahan's theory of control as an analogy for space protection requirements as illustrated by the below passage from *Space Power Theory*.

> If the United States, or any other spacefaring nation, wishes to retain its national space power, it must necessarily protect its interests in space. The term most commonly used for expressing this need is space control, derived from Mahan's notion of sea power and sea control. This notion—no matter its designation—is the primary principle of the exercise of space power.[21]

In summary, James Oberg achieved exactly what the Secretary of Defense asked of US Space Command: initiate the discussion on the subject of space power theory. *Space Power Theory* describes the unique characteristics of the space environment and the importance of understanding basic orbital mechanics. Further, Oberg describes the guiding tenets of exercising national power in space and realistically explains the requirement to protect space assets critical to retaining national power through space.

Oberg is an advocate of applying the Mahan approach to sea power to space power. Oberg essentially states the United States must seek awareness, control, and exploration through extensive investment to leverage space power. Again, Oberg does not articulate why space power is important to US national security and prosperity. Also, Oberg describes important requirements for the system, but does not describe the system itself. The system required is the space power theory that creates the linkage to national interests and informs policy formulation. Dr. Everett Dolman does recommend an approach to applying space power and linkages to geopolitics.

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[21] Ibid., 137.

Dolman recently emerged as a leading space theorist and has contributed significantly to carrying forward the discussion of space theory. Dr. Dolman's research as a Professor of Comparative Military Studies at the US Air Force's School of Advanced Air and Space Studies centers on geopolitics and grand strategy. He began his career as an intelligence analyst for the National Security Agency before working for the United States Space Command in 1986.[22] Dolman's extensive experience in the area of national security and space operations provide credence to his ideas on future US space strategy and policy. Dolman collaborated with Dr. Colin Gray, a leading modern strategist, in writing *Astropolitik: Classical Geopolitics in the Space Age* as part of Colin Gray's Cass Series of works on Strategy and History.[23] Additionally, Dolman recently published a report for the Marshall Institute entitled, *Toward a U.S. Grand Strategy in Space*.[24] Dolman presents a unique space power theory through his writings. Dolman's space power theory is outlined in the following paragraphs.

Dolman presented the following logic in his argument for space control concept. 'Who controls Low-Earth Orbit controls Near-Earth Space. Who controls Near-Earth Space dominates Terra. Who dominates Terra determines the destiny of mankind.' Dolman's logic is based on the realities he described through orbital mechanics and near current technological capabilities. *Astropolitik* suggests three steps to achieve rapid space

[22] Everett Dolman, "Profile," The Marshall Institute, http://www.marshall.org/experts (accessed October 28, 2010).

[23] Everett C. Dolman, *Astropolitik: Classical Geopolitics in the Space Age* (Strategy and History), (Routledge, 2001), Introduction.

[24] Everett Dolman, Peter Hays and Karl Mueller, "Toward a U.S. Grand Strategy in Space," *Space Security - Policy and Arms Control*, http://www.marshall.org/pdf/materials/408.pdf (accessed December 7, 2010).

dominance for the United States and the establishment of total space control. First, Dolman recommends the US immediately withdraw from the Outer Space Treaty (OST) of 1967 and establish a principle of free-market sovereignty in space. Second, the US must seize military control of Low-Earth Orbit (LEO) for the purposes of regulating all entry to the cosmos in addition to deploying kinetic and directed energy weapons systems. Third, Dolman recommends the establishment of a national space coordination agency to define, separate, and coordinate the efforts of commercial, civilian, and military space projects.[25]

Everett Dolman significantly advances the discussion on space power theory by applying geography to space and provides an explanation for the significance of astrogeography. Dolman frames space and specifically low earth orbit (LEO) as a strategic environment. Framing the space medium as a strategic environment is a novel concept. Dolman applies the laws of astromechanics to show the significance of certain orbits and launch sites. Further, applying Dolman's environmental frame to the Lupton and Oberg theories allows for the expansion of space power ideas. Additionally, Dolman provides a new approach to space control doctrine as presented by Lupton in *On Space Warfare.*

Dolman approaches the significance of space power to national interests and presents a framework for space power implementation. However, Dolman focuses on the astrogeographical significance and falls short of identifying the political and economic factors related to the astrogeography. Further, Dolman's recommended framework does

[25] Dolman, *Astropolitik,* 157.

not pass the rigors of feasible diplomatic actions by the United States and fails to clearly relate actions to national interests beyond the control of low earth orbit.

An Evolution of Ideas

Lupton, Oberg, and Dolman all present creative ideas for the application of US space power. Their efforts have generated significant advances in space power theory, policy, and doctrine. This monograph identifies the shortfalls of past space power theories and incorporates their logical and practical ideas. Again, the significant shortfalls of current space power theory are the failure both to address the linkage between the space domain and national interests and relate activities such as commercialization and space protection. The imperative concepts to be carried forward are clearly applying the Mahan concept of sea control to the space domain, increasing space domain awareness, investing in technology, and anticipating the eventual militarization of space and space access.

Chapter Four: The Relationship of Space Power and Great Power Status for the United States

> …space preeminence is essential if the U.S. is to be a great power and continue to be a great power.[26]
>
> --Major General Armor, USAF (Retired)
> Director, National Security Space Office

The influence of space operations has just recently begun to extend its potential beyond technocrats and strategists. Space has begun to reveal itself in the daily lives of the global community. Navigation devices, satellite based communication, and satellite based environmental monitoring regularly influence individual prosperity by expanding economic bases, much like maritime technology has done for centuries. However, the history of space power is much shorter when compared to globalized maritime operations. Space is an established prosperity mechanism and continues to grow with technology. However, the concepts of space as a power mechanism are in the developmental stage. Specifically, the definition of space power is difficult to reinforce with historical examples beyond the known outcomes of conflicts such as the Cold War and Operation Desert Storm. Therefore, the rapidly evolving technological space environment is difficult to understand and even more problematic for prediction.

To meet the requirements for great power status as defined by Vesna Danilovic in the contemporary global environment, space power must be included as part of national strategies. National strategies which must address space power include the external defense strategy, the homeland defense strategy, the economic strategy, the international

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[26] James Armor et al., "A Day Without Space: Economic and National Security Ramifications," The George C. Marshall Institute Roundtable Series(Washington, D.C., October 16, 2008), http://www.marshall.org/article.php?id=728 (accessed December 2, 2010)

relations strategy, the energy strategy, the resource conservation strategy, and the information strategy for the United States. Aggregates of different proportions of these national strategies generally combine to produce the national security strategy for the United States. Therefore, space power is a critical element that impacts all the major areas of a national security in the contemporary environment.

This monograph identifies why space is important in order to construct a narrative on the best space power framework for the United States. The following analysis applies the criteria for the great power concept presented by Vesna Danilovic. To review briefly, the power dimension provides an indication of military strength, economic potential, and political influence. The spatial dimension provides an indication of the potential for power projection and freedom of action to advance a nation's interests. Lastly, the status dimension indicates the acceptance of the role as a great power through demonstrated leadership within the global community. The following section examines the current and probable near term impacts of space power on the three dimensions of great power status and sustainment.

Space Power and the Power Dimension of Great Power Status

Space power provides significant sources of military, economic power, and political power. The military effects from space power are located in both the terrestrial and extra-terrestrial media. Examples of military effects in each of the media include precision guided munitions and persistent surveillance in the terrestrial medium to the

capability to disable satellites in the extraterrestrial medium.[27] The economic effects are more difficult to define, yet the economic effects serve as the center of gravity in the mass of reasons to develop space power theory. Examples of economic effects include sustained growth in the communications, transportation, and environmental monitoring sectors. Space power has demonstrated the ability to create substantial political power for the United States such as at the Reykjavík summit. The following paragraphs provide additional ideas on the relationship of space power to military, economic, and political power.

Military Power

Space power is a critical aspect of the United States military in winning tactical engagements and seeking strategic advantages. Spaced based national security enablers provide significant force overmatch and complement terrestrial based military power. Military aspects of space power are reaching a status commensurate with the customary land, naval, and air components in terms of increasing the United States' ability to wage war. However, the relationship between space power and military power is not quite as linear as the relationship of land forces and the ability to place a nation's military power at a specific geographic point. Additionally, military action in space compared to military action enabled through space activities is currently liminted by the Outer Space Treaty.[28] The militarization of space is a highly incendiary subject within the global community,

[27] National Defense University, Industrial College of the Armed Forces, "Industry Study, Space Industry, Spring 2009," Ms. Kathleen Callahan, 16.

[28] "Treaty of the Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies," October 10, 1967, United Nations. Referred to as the Outer Space Treaty (OST).

yet several space theorists suggest militarization of space has begun and is irretraceable.[29] Space power is a significant contributor to the military power of the United States through space based applications and the potential to apply military options within space. Further, space power serves as a fundamental component to the United States influence within the power dimension.

Economic Power

Space power currently creates considerable economic power for the United States, and research demonstrates the enormous potential as an emerging market. Economic power is generated through the rapidly expanding commercial space industry and the efficiencies generated through the application of space enablers such as the Global Positioning Satellite (GPS) constellation. The space industry is defined as the activities associated with the core elements of launch, satellite, and control. Sectors involved with these activities include civil, commercial, government, and military users.[30] The Space Foundation, which is a leading non-profit organization focusing on the expansion of space endeavors, recently released a report highlighting growth within the space industry. According to research conducted by The Space Foundation, global space revenues reached $251 billion in 2007 and demonstrated a sustained growth rate of 11%.[31] Additionally, The Space Foundation established a Space Foundation Index as part of the space industry analysis. The Space Foundation Index tracks the market performance of

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[29] Dolman, *Astropolitik,* 151.

[30] National Defense University, Industrial College of the Armed Forces, "Industry Study, Space Industry, Spring 2009*,"* 1.

[31] The Space Foundation, "The Space Report 2008: The Authoritative Guide to Global Space Activity," ed. John M. Diamond (Colorado Springs: The Space Foundation, 2008), 6.

31 public companies that derive a significant portion of their revenue from space-related assets and activities. The Space Foundation Index increased by more than 29% from June 2005 through December 2007. This growth paced the NASDAQ Composite Index and lead the S&P 500 Index.[32] This trend suggests global space revenues may exceed $1.5 trillion by 2025. The two major space revenue contributors to global revenues are satellite based products and services representing 55% and US government spending representing 25%.[33] Global positioning system equipment and direct-to-television services lead the space economic sectors. Satellite based products and services have surpassed US government spending as space revenue generators and indicate the role of commercialized space within the US economy. The economic power generated by the US space industry is a critical component to US economic power and demonstrates the potential for significant growth both through current capabilities and the expansion of emerging technologies.

Political Power

Space power contains substantial demonstrated potential for political influence, influence which affects both the domestic population and international actors. The political influence of space power lies within the perception of possibilities. Status as the global space leader provides a critical political overmatch in crafting the perceived possibilities within space commercialization, space militarization, and space exploration into real political influence. The Reykjavik Summit held between President Ronald

[32] Elliot Pulham, "Space Report Reveals $251 Billion Global Space Economy in 2007," The Space Foundation, http://www.spacefoundation.org/news/story.php?id=502 (accessed December 8, 2010).

[33] Ibid.

Reagan and Secretary-General of the Communist Party of the Soviet Union Mikhail Gorbachev in early October of 1986 is an example of the political influence associated with the possibilities within US space power. The US Strategic Defense Initiative (SDI), or star wars program, proved to be the most valuable bargaining chip for the US in negotiating an arms reduction of nuclear weapons with the Soviet Union. Despite the significant technological challenges and limited progress of the SDI Program at the time of the Reykjavik Summit, the perceived possibilities of the program supplied enormous political power to President Reagan. Negotiating for the significant reduction in SDI research, Secretary-General Gorbachev proposed the extreme measure of complete mutual dismantlement of nuclear arms. However, recognizing the political influence of even the possibility of the SDI program, President Reagan countered the offer with limiting the SDI Program to laboratory research while retaining a mutually acceptable level of nuclear arms reduction. The negotiations concluded without reaching an agreement on the continuation of nuclear arms reduction. However, the possibilities of space power overmatch clearly influenced political outcomes. .

The political influences of space power are equally mobilizing on domestic populations. Public statements by political leaders stating awe-inspiring goals associated with space exploration create considerable political capital. Political capital is generated through reinforced national pride and confidence in the government to achieve seemingly unfathomable results. Examples include the Saturn Project, the Space Shuttle Program, and the recent global access to position, navigation, and timing (PNT) capabilities. As the global leader in space, US political influence is only limited by imagination and the audacity to set goals at the edge of the possible.

Space Power and the Spatial Dimension

Space power provides the United States both a situational awareness advantage and a critical power projection platform. Space power enables power projection through the land, sea, air, and information media. Economically, space power enables commercial extensions of US power to reach global customers competitively. Situational awareness is enabled through environmental monitoring capabilities, electronic surveillance, and a reliable global communications network. A recent speech by a leading Russian military theorist reflects the penetration of the United States' awareness capabilities into the perceptions of potential adversaries. Vladimir Slipchenko, in an address given in November 2004 as part of the *Polit.ru Public Lectures* project, presented his theory on "sixth generation warfare" or the application of precision guided weapons. During his presentation, Slipchenko highlighted his perception that efforts by US governmental cartographers, participating in a Space Shuttle Endeavor mission, produced a unique three-dimensional electronic world map. Slipchenko continued that this unique high precision imagery provides the United States with a capability to execute unmatched precision guided weapon strikes.[34] Continued collection and refinement of geospatial information lends itself to increasing the perception of global spatial awareness by the United States. This global awareness, real or perceived, is fundamental to power projection and results in considerable power in the spatial dimension of great power status.

[34] Foreign Military Studies Office, *Future War*, 2005, Remarks by Vladimir Slipchenko, (Moscow, 2004), 21-25.

Space power enables global communications for both military and commercial consumers. Global communications are a critical component to the power projection of the United States and grow more important as the United States progresses through the information age. Space based communications provide the ability to establish a global information network among the elements of national power. This global information network is as a virtual continuous global presence and greatly enhances the power associated with the spatial dimension of great power status.

Space Power and the Status Dimension

According to Vesna Danilovic, part of attaining great power status is demonstrating responsible leadership within the global community and acknowledging one's self as a great power. Leading through space power is critical to communicate through deeds to the global community of the United States commitment to providing leadership into the future of the information age and beyond. The United States National Space Policy clearly communicates the intention to strengthen space leadership. The major components related to the United States' continued leadership in space include:[35]

- Reassure allies of U.S. commitments to collective self-defense.
- Identify areas of mutual interest and benefit.
- Promote U.S. commercial space regulations and encourage interoperability with these regulations.

The commitment to continuing the United States' demonstrated leadership in space reinforces the role of the United States as a global leader. The US space program maintains a strong history of leading through demonstrated innovation, courage, and

[35] The White House, "Fact Sheet: National Space Policy, 2010," 6.

responsibility. These three factors combine with seeking active leadership in space activities to allow space power to translate into substantial national power within the status dimension of great power status.

Space Power Theory Fundamentals

The following persistent truths describe activities central to understanding the relationship of space power and status as great power for the United States.

- The commercial space industry is the central component to space power growth.
- Global space access is increasing and generates resource competition.
- The military must protect national interests and provide freedom of action for commercial actors in the great common of space.
- Space exploration is critical to sustain collective innovation for the United States.
- National space based enablers are critical to maintain great power status within the power-spatial-status dimension framework.

These proposed persistent truths frame the theoretical model to develop a space power theory which describes purposeful activities aimed at sustaining US security through the information age.

Chapter Five: Space Power Theory, An Integrated Systems Approach

> Naval strategy has indeed for its end to found, support, and increase, as well in peace as in war, the sea power of a country.[36]
>
> -- Captain Alfred Mahan

Prevailing space power theory is myopic and fails to provide a clear understanding of how space power relates to US national interests. The axioms stated in chapter four are the foundation for the description of how space power affects great power status for the United States. According to Paul Reynolds, a proper theory should clearly demonstrate the nature of relationships and provide a useful set of ideas to increase prediction and control. Prediction and control are achieved by generating a greater understanding. Typologies and explanations synthesize information to create understanding. The desired result is a clearly defined theory that contributes to the scientific body of knowledge through a greater understanding of the relationships.[37] The following chapter presents a new idea on the application of a historical theoretical concept with a new approach of organizing the causal relationships associated with space power.[38]

The historical theoretical starting point is Mahan's theory of sea power. Alfred Mahan's theory of sea power provides a powerful analytical tool for the examination of both the potential for space as a power medium and the associated application of space

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[36] Alfred Thayer Mahan, *Influence of Sea-Power upon History, 1660-1783* (Boston: Little Brown & Co (T), 1980), 89.

[37] Paul Davidson Reynolds, *A Primer in Theory Construction.*, Facsimile ed. (New York: Prentice Hall, 1971), 3-9.

[38] Ibid., 151.

power theory axioms. The angles, velocities, and distances in space relative to the earth required for applied designs have established an environment much like the oceans of the world. Dolman and Lupton assert this analogy through their space control theories. Certain orbits provide certain capabilities, just as certain shipping lanes are required for particular influence aligned with national or economic objectives.[39] Therefore, the medium of space has evolved to contain similar power requirements and vulnerabilities for nations seeking to leverage the world's oceans. Mahan suggests that the relationship between commercial export capabilities and the forcing functions to expand manufacturing enterprises are related to a nation's ability to reduce the risk to lucrative transport and collaborating manufacturing in protective endeavors on the sea.[40]

Space power theorists presented corollary relationships of the Mahan theory between sea power and space power. Brent Ziarnick introduced a series of space maxims in his article, "To Command the Stars: The Rise of Foundational Space Power Theory", which moved space power theory closer to Alfred Mahan's sea power theory. Ziarnick suggests that Mahan argued the fundamental utility of sea power was to allow for profitable sea commerce and industry that would generate the means for a nation at war. Further, in peace, the purpose of the navy is to protect the nation's instruments of sea power, principally merchant shipping.[41] Ziarnick created a foundation based on Mahan's sea power theory that allows for the examination of the utility and criticality of space

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[39] Everett C. Dolman, *Astropolitik: Classical Geopolitics in the Space Age (Strategy and History)*, annotated edition ed. (Great Britain: Routledge, 2001), 84.

[40] Alfred Thayer Mahan, *Influence of Sea-Power upon History, 1660-1783* (Boston: Little Brown & Co (T), 1980), 26-28.

[41] Brent Ziarnick, "To Command the Stars: The Rise of Foundational Space Power Theory," *High Frontier Journal* 3, no. 4 (2007): 24.

power. However, Ziarnick does not present typologies to explain the relationships of space activities. The following space power theory expands the theoretical concept of space power to include the organization of space activities required to fulfill the Mahanian maxims.

Space Power Theory: A Causal Approach

Space power theory should encompass space activities critical to generating prosperity and the means to protect freedom of action in space. Space activities are directly related to maintaining the strength of the United States in the power, status, and spatial dimensions. Therefore, freedom of action in space must be included in a holistic space power theory in order to allow for the protection of space exploration, commercial space endeavors, and critical space enablers. Space protection includes space awareness and vehicle control, space policy, space defense, and vehicle-payload survivability. The following sections expand on the ideas associated with core space activities and space protection applied within the theoretical context of the Mahanian sea power. Figure one illustrates the relationships between space exploration, commercial space endeavors, space enablers, and space protection.

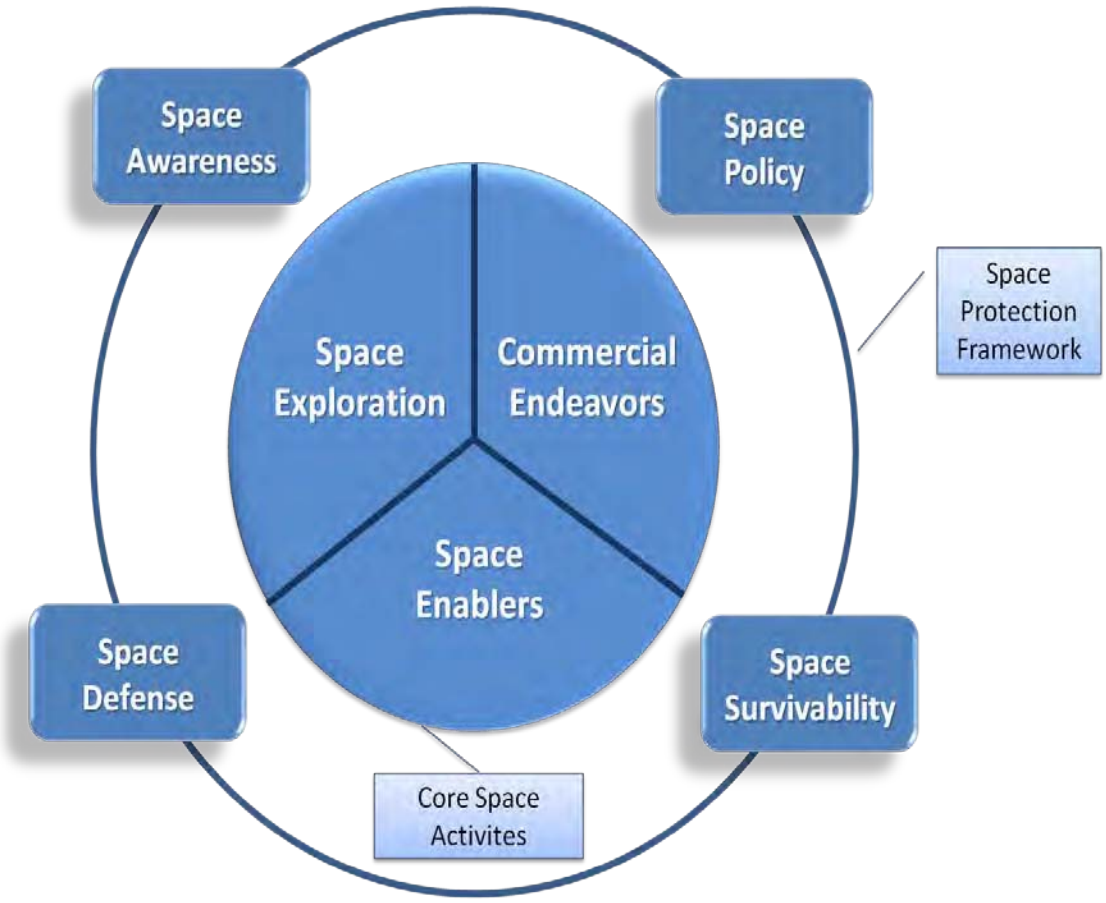

Figure 1. Core Space Activities and Space Protection Concept

Core Space Activities and Space Protection

Space exploration, commercial space endeavors, and space enablers serve as the core space activities associated with space power. These three core space power activities serve three distinct national processes: innovation, prosperity, and security. Space exploration produces cultural innovation within the geography of a nation. Commercial space endeavors are of increasing importance to the prosperity of the United States and the stability of global economic conditions. Stable global economic conditions reinforce the market growth within the United States according to economic stability theory. National space enablers are a critical requirement for military and civil security

infrastructure. Space exploration, commercial space endeavors, and national space enablers are examined within the Mahanian approach in the following sections.

Space Exploration

Space exploration is defined by NASA as the use of astronomy and space technology to explore outer space.[42] This core space activity is critical to status as a great power as space exploration provides the impetus to expand cultural innovation. John Sheldon, a Marshall Institute Fellow and visiting professor at the School of Advanced Aerospace Studies (SAAS), states that space exploration is the manifestation of American cultural DNA forged through the creative application of technology.[43] Mahan references the character of the people of a nation to determine its seaworthiness. The same argument can be made for space exploration. Space exploration requires the population of a nation be innovative, curious, and audacious. Further, the vision of space exploration is the engine which cultivates innovative characteristics of a culture. The Turner Theory states that American innovation and perseverance during the 19th century can be traced to the expansion of the American culture in the form of exploring west to California.[44] David Potter expanded on the Turner Theory and suggests that Americans internalize innovation when the culture is challenged by exploration. This internalization drives generational intellectual capital within the domestic educational context. Simply stated, the prospect of manned space exploration beyond known boundaries is the responsibility of the National

[42] James Oberg, "World Book, Space Exploration," NASA, http://www.nasa.gov/worldbook/space_exploration_worldbook.html (accessed December 8, 2010).

[43] John Sheldon et al., "A Day Without Space: Economic and National Security Ramifications," The George C. Marshall Institute Roundtable Series (Washington, D.C., October 16, 2008), http://www.marshall.org/article.php?id=728 (accessed December 2, 2010), 38.

[44]Frederick Jackson Turner, *The Frontier in American History* (Nabu Press, 2010).

government and is the catalyst to popularize innovation within both the academic and economic institutions. Space exploration is critical to sustaining the collective innovation which the United States requires for continued prosperity and great power status.

Commercial Endeavors

The United States Department of Commerce (DOC) maintains the Office of Space Commercialization and regularly collaborates with the Space Policy Institute at George Washington University. The fundamental curiosity of both the Office of Space Commercialization is illustrated in the following postulation stated in the quest for space economic data:

1. How important is the space sector to the overall economy?
2. What economic factors have driven the growth and change in space activities and how fast have they occurred?

These two questions are considered with the understanding that both the economic data on many components of the space sector are combined with tangential industries and that dual-use products and services (defense and commercial) characteristic of the industry.[45] Defining commercial space endeavors is critical to the proper examination of its place within the context of space power theory.

Space Enablers

National space enablers are defined as the space capacity to include space force application and space force enhancement to reinforce the elements of national power. Space force applications are combat operations in, through, and from space to influence

[45] United States Department of Commerce, "Space Economic Data, 2002," (US Printing Office, 2002), 1.

the course and outcome of conflict by holding terrestrial targets at risk.[46] Space force enhancements are combat support operations and force-multiplying capabilities delivered from space systems to improve the effectiveness of military forces as well as to support other intelligence, civil, and commercial users.[47] Space enablers are a critical component to sustaining advantages in the power, spatial, and status dimensions of great power status. Space enablers are the systems which provide the most significant capability overmatch and also serve as a critical vulnerability for the United States in terms of military and economic power. The following section addresses the framework to protect the core space activities.

Space Protection

Space protection includes the activities which assure freedom of action to execute the core space activities. The space protection framework includes maintaining space awareness, shaping space policy, engineering space survivability, and providing space defense. Recent successful anti-satellite (ASAT) and communication satellite (COMSAT) jamming efforts have prompted several US security organizations and the House Armed Services Subcommittee on Strategic Forces to re-evaluate the current lack of a protection strategy for space assets. Space is no longer a sanctuary and competing states no longer lack the economic capacity to engage in a space weapons race.[48] However, logic provides the basic insight that competing states would rather achieve an

[46] JP 1-02, 430.

[47] Ibid., 430.

[48] Terry Everett, "Arguing For a Comprehensive Space Protection Strategy," *Strategic Studies Quarterly* 1, no. 1 (Fall 2007): 25.

overmatch without the progression through competitive evolutions. Therefore, the options are either develop deterrent space protection measures or surrender freedom of action to the benevolent actions within the cosmos commons. The following sections outline the activities associated with the elements of a space protection framework.

Space Situational Awareness

Space situational awareness is defined by the United States Department of Defense as the requisite current and predictive knowledge of the space environment and the operational environment upon which space operations depend – including physical, virtual, and human domains – as well as all factors, activities, and events of friendly and adversary space forces across the spectrum of conflict.[49] Space situational awareness is currently a mission area associated with Department of Defense space control doctrine.[50] Space surveillance and the ability to control US space vehicles are critical components to space situational awareness. Space surveillance and vehicle control allow for space protection by allowing for advanced obstruction or kill vehicle detection and the ability to conduct survivability vectoring and/or survivability power down. Additionally, as within the other power media, the US government must monitor the space environment in order to reduce the frequency of mechanical anomalies. Space situational awareness is accomplished through integrated space and terrestrial based observation stations and vehicle control stations. Observation locations utilize both RADAR, optical platforms, and positional navigation systems to track objects within earth orbit to 36,000 nautical

[49] JP 1-02, 431.

[50] JP 3-14, II-7.

miles for the geostationary satellite belt and even further for highly elliptical orbits. The terrestrial locations are within the optimal geographic positions and must also be secured to ensure reliable space power projection.[51] Dr. John Sheldon is a leading space protection advocate and recently stated, "that without the ability to rapidly attribute any activity or action that happens in space to an agent, whether that be space weather, or debris, or intentional or unintentional interference, both in the physical domain and the spectral domain, we put ourselves at a disadvantage."[52]

Space Policy

Space policy is defined as the published national executive policy, the ratified international treaties, and the international space allegiances. Space protection must include comprehensive and aligned policy to support the national security strategy. Space policy is critical to shaping space protection against potential friction points such as space debris, spectrum interference, extra-terrestrial positional contentions, export agreements, and weapon systems within the space medium to name a few topics currently in policy discussions.

Space Survivability

Space survivability is the ability to match satellite health performance with design criteria in the hostile space environment. Solar winds and space debris are similar to the defeat mechanisms found in direct assent anti-satellite weapons technology. Increasing

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[51] Everett Dolman, *Astropolitik*, (New York: Frank Cass, 2002), 76-83.

[52] John Sheldon et al., "A Day Without Space: Economic and National Security Ramifications," The George C. Marshall Institute Roundtable Series (Washington, D.C., October 16, 2008), http://www.marshall.org/article.php?id=728 (accessed December 2, 2010), 35.

satellite survivability generally requires hardening against electromagnetic energy and small mass kinetic strikes. Satellite hardening increases launch weight which translates to increased delivery costs. However, certain platforms are critical to core space activities and either survivability or rapid replacement costs must be included in a holistic approach to maintaining space power. The alternative, as pointed out in "A Day Without Space",[53] is far too great to bear.

Space Defense

Space defense is termed defensive space control by the Department of Defense. Defensive space control is defined as operations conducted to preserve the ability to exploit space capabilities via active and passive actions, while protecting friendly space capabilities from attack, interference, or unintentional hazards.[54] Space defense does not argue for the weaponization of space in the same way that coastal defense does not require the weaponization of the water medium. Space defense are the measures placed to allow for unfettered and prosperous access to the outer space commons. This is especially true for commercial endeavors, as potential vendors cannot be expected to invest intellectual and liquid capital in uninsured investments. As Mahan suggested, the national military establishment must secure the domains required for manufacturing and commercial profit generation to occur. Space defense must be part of the greater space protection program and levy technology and policy against potential threats to US space power.

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[53] John Sheldon et al., "A Day Without Space: Economic and National Security Ramifications," The George C. Marshall Institute Roundtable Series (Washington, D.C., October 16, 2008), http://www.marshall.org/article.php?id=728 (accessed December 2, 2010), 41.

[54] JP1-02. 127.

Space Power Theory Implications

An integrated systems approach to space power theory satisfies two major requirements. It identifies the nature of certain space activities and it describes the relationship between space activities to national security considerations. Space activities generally represent a considerable investment on the part of citizens and venture capitalists. However, a space power theory that informs citizens and entrepreneurs of the core space activities' effects can maximize the space domain potential for the United States. The space protection concept highlights the reality that prosperity in space is directly related to freedom of action for national and commercial space endeavors. The relationship of core space activities and space protection is critical to develop a feasible, acceptable, suitable, and imperative national space power strategy.

Chapter Six: Conclusion, *Carpe Externum*

Science fiction works of American popular culture inspire the notion of practical space access in the not-so-distant future. However, the reality is that space access competition may overtake the United States' commitment to space access cooperation. The future lies in space and nation states will not suspend competition in benevolent cooperation for the greater good of mankind unless the state does not possess the ability to achieve overmatch on its own terms. However, for the near term future, the United States maintains the initiative. *Carpe Diem* in the information age translates to *Carpe Externum*,[55] or seize the opportunity to sustain strategic overmatch in outer space.

The United States requires space power in order to remain a great power through the information age. As illustrated in chapter two, great power status directly translates to national security for the United States. The framework provided by Vesna Danilovic allows for analysis of the historical significance of space power within the requirements to maintain great power status. Alfred Mahan provides the most appropriate theoretical concept, and several space power theorists have further advanced the discussion of the role of space power within the realm of geopolitics. A review of prominent space power theory provides an indication of the mode of thought applied to space power theory and the translation to policy and strategy. The fundamental truth is that space power is generated through the combination of the three core space activities: space exploration, commercial space endeavors, and national space enablers. A space power theory is required to address the fundamental strengths within the core space activities in addition

[55] http://www.eudict.com/?word=outer+space&go=Search&lang=englat

to creating the protection framework necessary to allow freedom of action. The space power theory presented in chapter five illustrates the relationships within the core space activities and the roles associated with the elements of the space protection framework.

Space is increasingly important to governments and business. Governments and business require refined frameworks and models to explain the relationship of activities in the space domain. Further research is necessary to test current theories and refine current frameworks. A revolution in space access technology is on the horizon and introduces tremendous opportunities. The United States must anticipate the impacts and envision frameworks to best capture the opportunities of lower cost space access. Additionally, further research must consider how increased accessibility to the current competitive reality of astrogeography relates to maintaining hegemonic stability for the United States. The "black swan"[56] of the information age is control of the space domain without the current economic barriers to access. Now is the time for ideas.

[56] Nassim Nicholas Taleb, *The Black Swan: The Impact of the Highly Improbable* (New York: Random House, 2007), xxi.

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